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Fractionation of metals by sequential extraction procedures (BCR and Tessier) in soil exposed to fire of wide temperature range

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Forest fire presents serious problem, especially in Mediterranean Region. Effects of fire are numerous, from climate change and deforestation to loss of soil organic matter and changes in soil properties. One of the effects, not well documented, is possible redistribution and/or remobilisation of pollutants previously deposited in the soil, due to the new physical and chemical soil properties and changes in equilibrium conditions.
For understanding and predicting possible redistribution and/or remobilisation of potential pollutants from soil, affected by fire different in temperature, several laboratory investigations were carried out. To evaluate the influence of organic matter on soil under fire, three soil samples were analysed and compared: (a) the one with added coniferous organic matter; (b) deciduous organic matter (b) and (c) soil without additional organic matter. Type of organic matter is closely related to pH of soil, as pH is influencing the mobility of some pollutants, e.g. metals. For that reason pH was also measured through all experimental steps. Each of mentioned soil samples (a, b and c) were heated at 1+3 different temperatures (25°C, 200°C, 500°C and 850°C). After heating, whereby fire effect on soil was simulated, samples were analysed by BCR protocol with the addition of a first step of sequential extraction procedure by Tessier and analysis of residual by aqua regia. Element fractionation of heavy metals by this procedure was used to determine the amounts of selected elements (Al, Cd, Cr, Co, Cu, Fe, Mn, Ni, Pb and Zn). Selected metal concentrations were determined using inductively coupled plasma atomic emission spectrometer. Further on, loss of organic matter was calculated after each heating procedure as well as the mineral composition. The mineral composition was determined using an X-ray diffraction.
From obtained results, it can be concluded that temperature has an influence on concentration of elements in specific step of sequential extraction procedures. The first step of Tessier and BCR extraction of samples heated at 250°C and 500°C showed increasing trend of elemental concentrations. Results of these steps are especially important since they indicate mobile fraction of the elements (exchangeable, water- and acid-soluble fraction), which can easily affect the environment. Extraction procedures of samples combusted at 850°C showed that decrease in measured elemental content occurred. Some correlation is also noticed between type of organic matter, pH and concentration of analysed elements.